Northwest Journal of Teacher Education

Volume 17
Issue 1 *Into the Academy*

Article 1

3-19-2022

Serving Students with Disabilities who are Culturally and Linguistically Diverse in Rural Communities: Technology Access is Essential

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Recommended Citation

Gallegos, Benjamin; Dieker, Lisa A.; Smith, Rebecca; and Ralston, Nicole C. (2022) "Serving Students with Disabilities who are Culturally and Linguistically Diverse in Rural Communities: Technology Access is Essential," *Northwest Journal of Teacher Education*: Vol. 17 : Iss. 1 , Article 1.
DOI: https://doi.org/10.15760/nwjte.2022.17.1.1

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Serving Students with Disabilities who are Culturally and Linguistically Diverse in Rural Communities: Technology Access is Essential

Abstract

Before the COVID-19 pandemic changed the educational landscape, students with disabilities, especially those who are culturally and linguistically diverse, and their special education teachers who worked and attended schools located in rural communities faced barriers most schools and communities experienced nationwide. As schools shifted to remote virtual learning due to the COVID-19 pandemic, rural schools were already at a disadvantage with the lack of resources with technology access. The call for addressing shortcomings in the various digital technology supports towards enhancing the teachers' delivery of content and the students' academic outcomes has been a continual challenge to address. This paper explores how students with disabilities who are culturally and linguistically diverse, living in rural communities are affected by their technology access, along with examining how this intersects with college and career pathways, and Science, Technology, Engineering, and Math (STEM) degrees and interests. This paper concludes with reminders and recommendations for researchers and schools to include in their technology access work and research the utilization of virtual-reality (VR), augmented-reality (AR), and video games.

Keywords

Students with disabilities, Culturally and Linguistically Diverse, Rural, Technology, access, virtual reality

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Cover Page Footnote

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This article is available in Northwest Journal of Teacher Education: https://pdxscholar.library.pdx.edu/nwjte/vol17/iss1/1

Introduction

Before the unfortunate and tragic events that took place due to the COVID -19 pandemic, Brown et al. (2019) discussed how students with disabilities (SWD) who are culturally and linguistically diverse (CLD) were underserved in their schools nationwide and historically faced inequities in their education. These similar impacts emerged during the COVID-19 pandemic when schools made the shift to remote virtual learning environments. Despite many schools not having adequate access to technology before the COVID -19 pandemic, the means to an education in response to the COVID -19 pandemic relied on technology access (Kelley et al., 2020). Technology access was already an issue as students and schools made the transition to remote virtual learning environments, and even if students have access to technology devices in or outside of their school settings, the access to online connectivity is usually weak or hard to establish (Bice-Urbach & Kratochwill, 2016; Zheng et al., 2016). The educational delivery model of remote virtual learning had negative effects that were alarming with how SWD were not receiving an adequate education (Jones et al., 2020). In rural communities, the lack of supports and the historical barriers to meeting students' needs were amplified during the COVID- 19 pandemic and access to technology and reliable online connections are just an example of mounting inequities (Gross et al., 2020; Tieken & Montgomery, 2021).

The research on technology access recommendations and the critical need to address this gap in rural communities has been on-going. With examining the deficits and needs of technology in rural schools, the *National Rural Education Association (NREA) Research Agenda –2016-2021* recommendations identified 10 priorities. One of the 10 research priorities included technology integration due to PK-12 schools in rural communities struggling with acquiring, implementing, receiving supports, and access to technology (National Rural Education Association, 2016). This priority was written before the COVID-19 pandemic. In the *AASA, The School Superintendent's Association, & Rural School Community Trust report* (AASA, 2017), recommendations that were centered on technology included the need for better practices and access to technology for both the students and teachers. Both these reports were written before the shift to remote virtual learning due to the COVID -19 pandemic. These needs are on-going even with schools switching back to in-person learning and for the many students and teachers who continue in the remote virtual learning environments, technology access is still essential. Many special educators are now reimagining the possibilities of technology access as they shift back into their brick and mortar classrooms to teach their students face-to-face (Young & Donovan, 2020).

Purpose

The purpose of this paper is to further discuss the critical need to get technology access and hardware in the hands of students and teachers in rural communities and to examine the intersections of technology access with college and career pathways, and Science, Technology, Engineering, and Math (STEM) related degrees and interest, while illuminating how virtual-reality (VR), augmented-reality (AR), and video games have been used in teaching and learning. With the longstanding history of barriers around technology access in rural communities, while researchers and schools continue to address these issues, it is crucial to plan and imagine how implementing innovative virtual environments (e.g., VR, AR, and video games) in K-12 schools can bolster technology access plans. The aim of the contributions of this work is to promote equity for students who are historically undeserved and to discuss examples on ways they have been underserved. The goal is not to simply discuss the unequitable issues students may face but to also look at what is taking place in higher education, and existing technologies that may serve as advantageous tools for students and teachers.

Impacts in College and Career Pathways

Students living in low socioeconomic status (SES) communities, including rural communities, are likely to be at an educational and economic disadvantage (Tieken & Montgomery, 2021). Ratledge et al. (2020) pointed out that for students living in rural communities, the high school graduation rates, the data appeared to be comparable with their peers in urban and suburban communities; however, enrollment rates into colleges and universities were significantly lower than students from urban and suburban communities. If high school students living in rural communities' enrollment into college and career pathways were at a lower rate than their peers in urban and suburban communities, it may be beneficial to consider what is taking place in higher education with technology. The *NMC Horizon Report: 2018 Higher Education Edition* (Becker et al., 2018) indicated the shifts and changes for the next five years of higher education technology integration and practices at the time of the 2018 report. Becker et al. (2018) highlighted the trends and needs taking place with technology integration in higher education. Examples of the projections of technology integration in the report showed a shift from previous years from developments in technology going from tablets, 3D printing, and mobile learning, evolving towards artificial intelligence (AI), mixed-realty simulation, and robotics. In the Becker et al. (2018) report, the authors provided examples of significant challenges with technology integration from previous years on personalizing learning, embracing radical change, and scaling teaching innovations, to emphasizing why, addressing achievement gaps, and advancing digital equity.

While higher education progressed towards technology integration, PK-12 rural schools continue to struggle with general digital technology access such as

online connectivity, technology devices capability of running updated software and programs, and professional development on integrating technology for teachers (Kalonde, 2017). Beyond technology access or community type, historically, the on-going issues of educational equality and inequality for SWD who are CLD continues to be unresolved (Artiles, 2011; Artiles, 2015). Students who live in areas identified as rural communities face unique challenges, and these issues are further compounded when a student in these communities have a disability and are CLD (Conroy, 2012; Sindelar et al., 2018). The initial issue is access to the use of technology, and yet even when access is available, the opportunities for students with and without disabilities in rural settings to effectively use digital tools may be limited (Kalonde, 2017). For schools in rural communities, technology access can no longer be an option; it is essential for all students, especially for SWD from CLD backgrounds, to have equitable technology access to enhance their college and career pathways (Fox & McDermott, 2015).

Implications in STEM Degrees and Career Interests

In the National Science Foundation (NSF) *2019 Women, Minorities, and Persons with Disabilities in Science and Engineering* report, individuals with disabilities accounted for about 10% of the science and engineering workforce (NSF, 2019). Individuals who represent CLD populations (i.e., underrepresented minorities) were still underrepresented in STEM related college and careers (NSF, 2019). For example, Lu (2015) found that Latino males were reported as the individuals who were least likely to earn a STEM degree among racial/ethnicity groups. Latinx were considered the group with the highest association of not completing or attaining a STEM-related degree (Simpkins et al., 2015). Many SWD in the U.S. struggle in science content areas (Drew et al., 2020). Students with disabilities (e.g., learning disability) and CLD in rural communities have further performed at a lower rate (Helman et al., 2015). Blank (2013) noted that students from low SES communities often come from schools with limited science instruction in their classrooms. A disproportionate number of schools in low SES communities were found to provide inadequate science instruction (Darling-Hammond, 2012). Further, Darling-Hammond (2012) noted these schools also lacked teaching staff, materials, and enriching activities in content areas, like science.

Students with disabilities (e.g., learning disabilities) who are CLD in rural settings are assumed to be low performers in science, but the research interventions available to support dualities of this kind are limited at best (Cramer, 2015). The academic challenges SWD from CLD backgrounds in rural communities' face are only magnified by the long-standing history of challenges in rural schools. Blank (2013) found students' SES status and backgrounds were factors to how, or if, students were interested in or pursued a STEM degree. For

students with learning disabilities (LD), the use of technology and virtual simulation could be a powerful means for accessing content and exploring learning interests rather than using limited and barrier-created, traditional learning materials (Wilson et al., 2011). A large portion of students who are CLD (i.e., Latinx) who pursued a post-secondary degree (i.e., community college) came from low SES communities and homes (Chacón, 2013). This fact is important to consider as students from communities that have been adversely affected and historically disadvantaged were found to lack having a member in their family who had attained a STEM related degree or career and received limited science instruction in their classrooms (Blank, 2013). Ample documentation exists that SWD who are CLD are disproportionally enrolled or do not attain STEM-related degrees (Lu, 2015; NSF, 2019).

A Glimpse into Historical and On-going Challenges Students with Disabilities who are Culturally and Linguistically Diverse in Rural Communities Face

The curriculum and teaching practices provided to all students, especially SWD in remote virtual learning environments, should not be treated equivocally as it was in the traditional brick and mortar school setting, and ensuring accessibility through technology devices, apps, platforms, and websites is essential (Herberger, 2020). Teachers in rural communities, before remote teaching in virtual classrooms, were most likely the only ones who provided supports to SWD, and once the shift into remote teaching happened, they were already doing so with limited supports. The lack of service and personnel who specializes in serving SWD in rural settings not only affects the classroom, but is also reflected by the limited number of personnel with special education expertise who serve in rural school districts (Bice-Urbach & Kratochwill, 2016). New special education teachers entering schools in rural communities are often the only teacher in their school who have the expertise or evidence-based knowledge on specifically serving SWD (Abell et al., 2014), and for new educators in the field, they often lack or have limited knowledge on serving students who are CLD (Pang, 2013). Teachers and staff from rural, low SES communities are serving a student population, mostly living in impoverished and poverty-stricken communities (Mattingly et al., 2011). According to Fishman (2015), students who live in rural communities in the U.S. make up approximately one-fifth of all students. Further, of all the counties identified with the highest poverty levels in the U.S., 96% of them are rural communities (Fishman, 2015). Fishman (2015) explained that rural communities in poverty are faced with being treated in isolation, and yet held to the same expectations of suburban, and urban communities, despite not having the resources, personnel, or academic attention associated with suburban and urban communities. Rural schools have been found, nationally, to spend more money on

their education and resources, but the spending is due to the high-needs rural schools face and the lack of integrated services found in larger communities, requiring higher amounts of funding (Levin et al., 2011).

Rural communities, combined with large minority populations, tend to be the neighborhoods or towns where most residents are of low SES status (Tieken & Montgomery, 2021). Schools in rural communities with high poverty rates face numerous historical inequalities, including skill level of teachers, supplies, poor conditions of the students' daily bus rides, and overall learning gains. The issues of the past are still relevant today: students who are racial and ethnic minorities (e.g., Latinx) from rural, low SES communities often are adversely affected by their daily bus ride due to poor riding conditions and the vast amounts of time away from instruction (Howley, 2001). Many students in rural communities spend an hour to over an hour on a one-way school bus ride going and coming from school daily (Zars, 1998). While the pedagogy and practices of teachers in classrooms will not eliminate these economic barriers, they can help support student learning in rural areas, especially related to promoting STEM education.

Recommendations

Examining research on instructional planning frameworks specifically created with the incorporation of technology to access learning content like the Universal Design for Learning (UDL), should be further explored in research. Using UDL for the benefit of all learners, including those with a CLD background and from rural communities with high poverty, holds promise (Evans et al., 2010). Despite challenges and barriers that affect the delivery of quality remote virtual learning modalities (e.g., online connectivity, access to technology, and trained educators in virtual learning environments), the principles of the universal design for learning (UDL) instructional planning framework in virtual online classrooms needed to be available and accessible to implement online (Smith, 2020).

Technology in Rural Schools for Teachers and Students

Technology as a means of providing engaging learning practices for SWD in rural communities could affect students' academic performance (Hudson et al., 2012). One potential tool that deserves further examination in bringing background knowledge and prior knowledge to students, often isolated from a more global community, is the use of virtual environments. Providing students in the rural settings with virtual experiences may serve as an emerging research construct to consider for this population (Vasquez et al., 2015). This push for more efficient online tools is evident for rural settings, and building research for teachers' use of

virtual environments for curriculum and instruction is needed (Vasquez & Serianni, 2012).

Although the literature on the use of virtual reality for student learning is still evolving, there are empirical studies that point to this innovative instructional strategy as a culturally responsive practice (i.e., Smith et al., 2021) and to reach SWD (i.e., Parsons & Cobb, 2011; Parsons & Mitchell, 2002). Virtual reality can expose students to diverse cultures through virtual travel and can reduce student anxiety, improve student confidence, and build student empathy (Alsever, 2017; Ferguson et al., 2014).

In addition to the affective benefits of VR as an instructional strategy, this technology can also help support the learning of students in rural communities, including those with learning differences. For instance, virtual reality platforms were found to positively impact social behaviors in students with autism (Parsons & Cobb, 2011; Parsons & Mitchell, 2002). Additionally, students with physical disabilities can experience alternative realities, such as walking or swimming. In the past two decades, researchers (i.e., Stainfield et al., 2000) discussed how students from economically disadvantaged backgrounds can be exposed to global excursions and virtual field trips that they may not have access to in their actual reality. Finally, virtual reality can be a means of promoting student interest and competence with technology, which can potentially increase the pipeline of students to future careers in STEM (Dieker et al., 2012).

A common concern in a rural setting is the availability of teachers and support personnel who are highly qualified or have access to state-of-the-art professional development, as well as technology access (Vasquez & Serianni, 2012). Promising empirical research has emerged on addressing special education teachers' needs in rural schools, using virtual environments (i.e., online professional development) to enhance teacher practices (Erickson et al., 2012). As researchers in the field conducted studies on the use of virtual environments in the education space, educators have not considered how these environments could be applied or implemented towards instructional delivery or as a learning tool for their SWD in rural communities (Ludlow, 2015).

Virtual avatars and video games in rural communities

A 21st Century tool with potential to impact SWD and students who are CLD, both of whom lack background knowledge to comprehend science text at the middle school level (Helman et al., 2015), is the use of virtual avatars and video games. For example, the use of virtual simulation in mixed-reality environments (i.e., virtual and real life settings combined with interaction with virtual avatar(s) to simulate interaction with real individuals), could provide SWD and those from CLD backgrounds with educational learning supports through a model of

individualized learning coupled with personalized performance feedback (Dieker et al., 2014; Zhu et al., 2011). TeachLivE^{TM} (TLE) is a virtual reality simulator created and developed at the University of Central Florida. TeachLivE's research and development team has focused their research on the effects and interactions with the simulator in schools, including in rural communities (Dieker et al., 2015). Dieker et al. (2015) listed academic scenarios found in rural communities that may lead to future research to address the pressing needs of SWD and their teachers. Virtual avatars have the potential to serve as a supplemental academic support for SWD in rural settings (Zirzow, 2015). For instance, Kamhi-Stein et al. (2020) reported on a set of case studies where they found that student-teachers who were pursuing a Teaching English to Speakers of Other Languages (TESOL) credential had befitted in their practices in the teaching training in the Mursion mixed-reality classroom simulation TeachLivE^{TM} (TLE). How this type of environment might apply to SWD from CLD backgrounds in rural schools is a question that is still being addressed.

The research on using video games in a school setting is not novel in the field of education or in the literature (i.e., Marino & Beecher, 2010), but it could be a novelty for students with limited or sporadic education, like students from migrant families who live in rural communities. Levy (2011) reiterated how students who are Latinx with migrant, farming backgrounds lack access to technology, which may be beneficial to meeting their educational needs. Incorporating technology through educational video games for students who are CLD and struggling learners allowed for the educator to track students learning practices through game-based performances and identify the students' math skills during mathematical video game play (Zhang et al., 2015). Students with learning disabilities who learned science content by playing video games have shown to have an increase in academic engagement and performance (Marino et al., 2014).

Implications and Conclusion

Whether a student resides and attends school in either a rural or urban community, it appears they shared unifying issues in the virtual remote school settings during the COVID -19 pandemic, from online connectivity to being educated by teachers who were also new to teaching in the online environments (Basham et al., 2020). Basham et al. (2020) framed these experiences in remote virtual learning environments as opportunities in crisis. Tremmel et al. (2020) study examining how one rural school district responded during COVID-19 with technology access and supports to ensure teaching SWD needs were being met, was an example of how rural communities leverage their assets and strengths in the face of adversity. With these learned lessons of providing technology access to SWD in their remote

virtual learning environments, this momentum of ensuring technology access needs to continue (Young & Donovan, 2020).

The need for further empirical studies on CLD populations is needed, especially students in rural communities. These are not new sentiments in supporting students in rural communities and Vasquez et al. (2015) reminded us of this by putting out a challenge to the field of education to further conduct studies taking place in rural schools. Schools in rural communities are often viewed by families as the pinnacle of the community and may be the last hope of opportunity for ensuring the future generations of children and youth will secure employment and avoid economic turmoil (Sherman, & Sage, 2011). Empirical research in rural communities on promising digital technologies coupled with an educational climate that celebrates all students, including SWD who are CLD, may serve to continue the efforts of researchers who have been addressing the issues and promises towards serving SWD who are CLD in rural communities.

The hope is, readers use this literature to inform their work serving SWD who are CLD in rural communities and consider further exploring virtual reality and video games as a tool for teaching and learning, serve as a literature review article that supports researchers who are seeking and writing grants to serve this student population and teachers in their communities, and to add to the research on examining equity, accessibility, and supporting SWD who are CLD in rural communities.

References

Abell, M., Collins, B. C., Kleinert, H., & Pennington, R. (2014). Providing support for rural teachers of students with low incidence disabilities who are completing the Kentucky teacher internship program. *Rural Special Education Quarterly*, *33*(3), 14-18. https://doi.org/10.1177/875687051403300303

Artiles, A. J. (2011). Toward an interdisciplinary understanding of educational equity and difference the case of the racialization of ability. *Educational Researcher*, *40*(9), 431-445. https://doi.org/10.3102/0013189x11429391

Artiles, A. J. (2015). Beyond responsiveness to identity badges: Future research on culture in disability and implications for Response to Intervention. *Educational Review*, *67*(1), 1-22. https://doi.org/10.1080/00131911.2014.934322

AASA, The School Superintendent's Association, & Rural School Community Trust. (2017). *Leveling the playing field for rural students*. https://www.aasa.org/uploadedFiles/Equity/AASA_Rural_Equity_Report_FINAL.pdf

Alsever, J. (2017). Is virtual reality the ultimate empathy machine? *Wired*. https://www.wired.com/brandlab/2015/11/is-virtual-reality-the-ultimate-empathy-machine/

Basham, J. D., Blackorby, J., & Marino, M. T. (2020). Opportunity in crisis: The role of universal design for learning in educational redesign. *Learning Disabilities: A Contemporary Journal*, *18*(1), 71–91. https://eric.ed.gov/?id=EJ1264277

Becker, S. A., Brown, M., Dahlstrom, E., Davis, A., DePaul, K., Diaz, D., & Pomerantz, J. (2018). *NMC Horizon Report: 2018 Higher Education Edition*. EDUCAUSE. https://library.educause.edu/~/media/files/library/2018/8/2018horizonreport.pdf

Bice-Urbach, B. J., & Kratochwill, T. R. (2016). Teleconsultation: The use of technology to improve evidence-based practices in rural communities. *Journal of School Psychology*, *56*, 27-43. https://doi:10.1016/j.jsp.2016.02.001

Blank, R. K. (2013). Science instructional time is declining in elementary schools: What are the implications for student achievement and closing the gap? *Science Education, 97*(6), 830–847. http://doi.org/10.1002/sce.21078

Brown, M. R., Dennis, J. P., & Matute-Chavarria, M. (2019). Cultural relevance in special education: Current status and future directions. *Intervention in School and Clinic*, *54*(5), 304–310. https://doi.org/10.1177/1053451218819252

Chacón, J. A. (2013). The experiences of low-income Latino/a students in the California community college system at a time of education budget cuts. *Journal of Hispanic Higher Education*, *12*(3), 207-224. doi:10.1177/1538192712468158

Conroy, P. W. (2012). Collaborating with cultural and linguistically diverse families of students in rural schools who receive special education services. *Rural Special Education Quarterly*, *31*(3), 24-28. https://doi.org/10.1177/875687051203100304

Cramer, L. (2015). Inequities of intervention among culturally and linguistically diverse students. *Perspectives on Urban Education, 12*(1), 1-9. https://files.eric.ed.gov/fulltext/EJ1056724.pdf

Darling-Hammond, L. (2012). Redlining our schools: Why is congress writing off poor children? Linda Darling-Hammond. *The Nation, 294*(5), 11-15. https://www.thenation.com/article/archive/why-congress-redlining-our-schools/

Dieker, L. A., Grillo, K., & Ramlakhan, N. (2012). The use of virtual and simulated teaching and learning environments: Inviting gifted students into science, technology, engineering, and mathematics careers (STEM) through summer partnerships. *Gifted Education International*, *28*(1), 96–106. https://doi.org/10.1177/0261429411427647

Dieker, L. A., Hynes, M. C., Hughes, C. E., Hardin, S., & Becht, K. (2015). TLE TeachLivE^{TM}: Using technology to provide quality professional development in rural schools. *Rural Special Education Quarterly, 34*(3), 11-16. https://doi.org/10.1177/875687051503400303

Dieker, L. A., Rodriguez, J. A., Lignugaris/Kraft, B., Hynes, M. C., & Hughes, C. E. (2014). The potential of simulated environments in teacher education: Current and future possibilities. *Teacher Education & Special Education*, *37*(1), 21-33. doi:10.1177/0888406413512683

Drew, S. V., Olinghouse, N. G., & Faggella-Luby, M. (2020). Reconceptualizing instruction for writing in science using the WiS Co-Planning Tool. *TEACHING Exceptional Children*, *52*(4), 210–221. http://dx.doi.org/10.1177/0040059919878669

Erickson, A. S. G., Noonan, P. M., & McCall, Z. (2012). Effectiveness of online professional development for rural special educators. *Rural Special Education Quarterly, 31*(1), 22-32. https://doi.org/10.1177/875687051203100104

Evans, C., Williams, J. B., King, L., & Metcalf, D. (2010). Modeling, guided instruction, and application of UDL in a rural special education teacher preparation program. *Rural Special Education Quarterly*, *29*(4), 41–48. https://doi.org/10.1177/875687051002900409

Fishman, D. (2015). School reform for rural America. *Education Next, 15*(3), 8-15. https://www.educationnext.org/school-reform-rural-america/

Fox, S. B., & McDermott, C. L. (2015). The role of 21st century skills in two rural regional areas of public education. *Journal for Leadership and Instruction, 14*(2), 26-30. https://files.eric.ed.gov/fulltext/EJ1080685.pdf

Ferguson, T. D., Howell, T. L., & Parsons, L. C. (2014). The birth experience: Learning through clinical simulation. *International Journal of Childbirth Education, 29*(3), 66-72. https://www.proquest.com/docview/1545045420?pq-origsite=gscholar&fromopenview=true

Gross, B., Opalka, A., & Center on Reinventing Public Education (CRPE). (2020). Too many schools leave learning to chance during the pandemic. In *Center on Reinventing Public Education*. Center on Reinventing Public Education. https://files.eric.ed.gov/fulltext/ED605576.pdf

Herberger, D. (2020). *Considerations for teachers providing distance learning to students with disabilities*. WestEd. https://www.wested.org/wp-content/uploads/2020/05/Teacher_Considerations_Distance_Learning_for_Students_with_Disabilities_FINAL.pdf

Helman, A. L., Calhoon, M. B., & Kern, L. (2015). Improving science vocabulary of high school English language learners with reading disabilities. *Learning Disability Quarterly, 38*(1), 40–52. https://doi.org/10.1177/0731948714539769

Howley, C. (2001). The rural school bus ride in five states: *A Report to the Rural School and Community Trust*. http://files.eric.ed.gov/fulltext/ED456013.pdf

Hudson, T. M., Knight, V., & Collins, B. C. (2012). Perceived effectiveness of web conferencing software in the digital environment to deliver a graduate course in applied behavior analysis. *Rural Special Education Quarterly, 31*(2), 27-39. https://doi.org/10.1177/875687051203100204

Jones, N., Vaughn, S., Fuchs, L., EdResearch for Recovery Project, Annenberg Institute for School Reform at Brown University, Results for America, Boston University (BU), & Vanderbilt University, P. C. (2020). Academic supports for students with disabilities. Brief No. 2. In *EdResearch for Recovery Project*. EdResearch for Recovery Project. https://eric.ed.gov/?id=ED607707

Kalonde, G. (2017). Technology use in rural schools: A study of a rural high school trying to use iPads in the classroom. *Rural Educator, 38*(3), 27–38. https://files.eric.ed.gov/fulltext/EJ1225158.pdf

Kamhi-Stein, L. D., Lao, R. S., & Issagholian, N. (2020). The future is now: Implementing mixed-reality learning environments as a tool for language

teacher preparation. *TESL-EJ*, *24*(3). https://files.eric.ed.gov/fulltext/EJ1275837.pdf

Kelley, B., Sisneros, L., & Education Commission of the States. (2020). Broadband *Access and the Digital Divides*. Policy Brief. In *Education Commission of the States*. Education Commission of the States. https://eric.ed.gov/?id=ED610063

Levin, J., Manship, K., Chambers, J., Johnson, J., & Blankenship, C. (2011). Do schools in rural and nonrural districts allocate resources differently? An analysis of spending and staffing patterns in the west region states. Issues & Answers. REL 2011-No. 099. *Regional Educational Laboratory West*. http://files.eric.ed.gov/fulltext/ED515211.pdf

Levy, M. S. (2011). Migrant laptops: Extending the academic day for the children of farm workers and their credit recovery via laptops. *Computers in the Schools, 28*(2), 140-157. https://doi.org/10.1080/07380569.2011.577396

Lu, C. (2015). Finding los científicos within: Latino male science identity development in the first college semester. *Journal of College Student Development, 56*(7), 740-745. https://doi.org/10.1353/csd.2015.0069

Ludlow, B. L. (2015). Virtual reality: Emerging applications and future directions. *Rural Special Education Quarterly*, *34*(3), 3-10. https://doi.org/10.1177/875687051503400302

Marino, M. T., & Beecher, C. C. (2010). Conceptualizing RTI in 21st-century secondary science classrooms: video games' potential to provide tiered support and progress monitoring for students with learning disabilities. *Learning Disability Quarterly*, *33*(4), 299-311. https://doi.org/10.1177/073194871003300407

Marino, M. T., Becht, K., Vasquez, E., Gallup, J. L., Basham, J. D., & Gallegos, B. (2014). Enhancing secondary science content accessibility with video games. *TEACHING Exceptional Children*, *47*(1), 27-34. https://doi.org/10.1177/0040059914542762

Mattingly, M. J., Johnson, K. M., & Schaefer, A. (2011). More poor kids in more poor places: Children increasingly live where poverty persists. Issue Brief Number 38. *Carsey Institute*. http://scholars.unh.edu/cgi/viewcontent.cgi?article=1149&context=carsey

National Rural Education Association. (2016). *National Rural Education Association (NREA) Research Agenda –2016-2021*. 10 Research Priorities. http://toolbox1.s3-website-us-west-2.amazonaws.com/site_0439/NREAResearchAgenda081116_082416.pdf

National Science Foundation, National Center for Science and Engineering Statistics. 2019. *Women, Minorities, and Persons with Disabilities in Science and Engineering: 2019.* Special Report NSF 19-304. Alexandria, VA. https://www.nsf.gov/statistics/wmpd.

Pang, Y. (2013). Preparing culturally competent PreK-12 educators. *The New England Reading Association Journal*, *49*(1), 77. https://www.proquest.com/docview/1439081292?pq-origsite=gscholar&fromopenview=true

Parsons, S., & Cobb, S. (2011). State-of-the-art of virtual reality technologies for children on the autism spectrum. *European Journal of Special Needs Education*, *26*(3), 355-366. https://doi.org/10.1080/08856257.2011.593831

Parsons, S., & Mitchell, P. (2002). The potential of virtual reality in social skills training for people with autistic spectrum disorders. *Journal of intellectual disability research*, *46*(5), 430-443. https://doi.org/10.1046/j.1365-2788.2002.00425.x

Ratledge, A., Dalporto, H., Lewy, E., & MDRC. (2020). COVID-19 and rural higher education: Rapid innovation and ideas for the future. Issue Focus. In *MDRC*. MDRC. https://files.eric.ed.gov/fulltext/ED610679.pdf

Sherman. J. & Sage, R. (2011). Sending off all your good treasures: Rural schools, brain-drain, and community survival in the wake of economic collapse. *Journal of Research in Rural Education, 26*(11), 1-13. http://jrre.psu.edu/articles/26-11.pdf

Simpkins, S. D., Price, C. D., & Garcia, K. (2015). Parental support and high school students' motivation in biology, chemistry, and physics: Understanding differences among Latino and Caucasian boys and girls. *Journal of Research in Science Teaching*, *52*(10), 1386-1407. https://doi.org/10.1002/tea.21246

Sindelar, Pua, D. J., Fisher, T., Peyton, D. J., Brownell, M. T., & Mason-Williams, L. (2018). The demand for special education teachers in rural schools revisited: An update on progress. *Rural Special Education Quarterly*, *37*(1), 12–20. https://doi.org/10.1177/8756870517749247

Smith, C. (2020). Challenges and opportunities for teaching students with disabilities during the COVID-19 pandemic. *International Journal of Multidisciplinary Perspectives in Higher Education*, *5*(1), 167–173. https://doi.org/10.32674/jimphe.v5i1.2619

Smith, R., Ralston, N. C., & Gallegos, B. (2021). Integrating culturally responsive pedagogy and virtual reality: Preparing preservice educators for secondary language arts classes. In C. M. Moran and M. Rice (Eds.), *Virtual and augmented reality in English language arts education* (pp. 225-244). Lexington Books.

Stainfield, J., Fisher, P., Ford, B., & Solem, M. (2000). International virtual field trips: A new direction? *Journal of Geography in Higher Education*, *24*(2), 255–262. https://doi.org/10.1080/713677387

Tieken, M. C., & Montgomery, M. K. (2021). Challenges facing schools in rural America. *State Education Standard*, *21*(1), 6–11. https://files.eric.ed.gov/fulltext/EJ1286832.pdf

Tremmel, P., Myers, R., Brunow, D. A., & Hott, B. L. (2020). Educating students with disabilities during the COVID-19 pandemic: Lessons learned from Commerce Independent School District. *Rural Special Education Quarterly*, *39*(4), 201–210. https://doi.org/10.1177/8756870520958114

Vasquez, E., & Serianni, B. A. (2012). Research and practice in distance education for K-12 students with disabilities. *Rural Special Education Quarterly, 31*(4), 33. https://doi.org/10.1177/875687051203100406

Vasquez, E., Nagendran, A., Welch, G. F., Marino, M. T., Hughes, D. E., Koch, A., & Delisio, L. (2015). Virtual learning environments for students with disabilities: A review and analysis of the empirical literature and two case studies. *Rural Special Education Quarterly, 34*(3), 26-32. https://doi.org/10.1177/875687051503400306

Wilson, C. H., Brice, C., Carter, E. I., Fleming, J. C., Hay, D. D., Hicks, J. D., Picot, E., Taylor, A. M., & Weaver, J. (2011). Familiar technology promotes academic success for students with exceptional learning needs. https://files.eric.ed.gov/fulltext/ED530541.pdf

Young, J., Donovan, W., & Pioneer Institute for Public Policy Research. (2020). Shifting special needs students to online learning in the COVID-19 spring: Challenges for students, families, and teachers. Pioneer Education Policy Brief. In *Pioneer Institute for Public Policy Research*. Pioneer Institute for Public Policy Research. https://pioneerinstitute.org/pioneer-research/covid-pioneer-research/shifting-special-needs-students-to-online-learning-in-the-covid-19-spring-2/

Zars, B. (1998). Long rides, tough hides: Enduring long school bus rides. *Rural School and Community Trust Policy Program*. http://www.eric.ed.gov/contentdelivery/servlet/ERICServlet?accno=ED432419

Zhang, M., Trussell, R. P., Gallegos, B., & Asam, R. R. (2015). Using math apps for improving student learning: An exploratory study in an inclusive fourth grade classroom. *TechTrends*, *59*(2), 32-39. https://doi.org/10.1007/s11528-015-0837-y

Zheng, Warschauer, M., Lin, C.-H., & Chang, C. (2016). Learning in one-to-one laptop environments: A meta-analysis and research synthesis. *Review of Educational Research*, *86*(4), 1052–1084. https://doi.org/10.3102/0034654316628645

Zhu, J., Moshell, J. M., Ontañón, S., Erbiceanu, E., & Hughes, C. E. (2011). Why can't a virtual character be more like a human: A mixed-initiative approach to believable agents. In *International Conference on Virtual and*

Mixed Reality (pp. 289-296). Springer Berlin Heidelberg. https://dl.acm.org/doi/10.5555/2028716.2028751

Zirzow. (2015). Signing avatars: Using virtual reality to support students with hearing loss. *Rural Special Education Quarterly*, *34*(3), 33–36. https://doi.org/10.1177/875687051503400307